

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Program Procedure	NUMBER IH96150
	REVISION FINAL rev1
Subject: Noise and Hearing Conservation Program: Guidance on Control of Noise	DATE 05/29/01
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1.0 Purpose & Scope

Purpose: The purpose of this procedure is to provide guidance from the NHC administrator to noise and hearing conservation service providers in key elements that are part of an effective Noise and Hearing Conservation (NHC) program.

This document describes program elements necessary for compliance with OSHA and DOE regulations.

2.0 Responsibilities

- 2.1 The BNL Noise and Hearing Conservation program is implemented through a matrixed organization of several BNL organization units. BNL organization units providing NHC services are responsible to follow this SOP if applicable in conducting their operations.
- 2.2 The *SHSD Noise and Hearing Conservation Program Administrator* maintains this SOP in accordance with current regulatory drivers.

3.0 Definitions

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none

4.0 Prerequisites

none

5.0 Precautions

none

6.0 Procedure

The service providers follow existing SOPs and use the Attachments of this SOP for guidance on technical issues relating to performing testing and issuing personal protective equipment.

7.0 REFERENCES

7.1 *BNL OH&S Guide 2.4.0 Noise (10/6/82)*

7.2 29CFR1910.95 OSHA Occupational Noise Exposure Standard

7.3 ACGIH Threshold Limit Values and BEIs

7.4 OSHA *Technical Manual* SECTION III: CHAPTER 5

7.5 *DOE Order 440.1A*

8.0 ATTACHMENTS

8.1 BNL Program Administrator's Guidance on Engineering, Administrative and Personal Protective Equipment Control of Noise Sources

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9.0 Documentation

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Attachment 8.1
Guidance on

Engineering Controls, Administrative Controls
and Personal Protective Equipment

Abatement of Noise sources

The IH group will recommend engineering control for correction or reduction of existing noise sources which result in employee exposure to excessive noise. Selection of appropriate control measures shall be based on available technology, vendor literature, and previous experience. Sources of information utilized shall include ANSI, ASA, NIOSH, ACGIH publications.

- Noise control should minimize sources of noise; prevent the propagation, amplification, and reverberation of noise; and protect workers from excessive noise. Engineering controls include anti-vibration machine mountings, acoustical enclosures, and component replacement.
- High frequency noise is very directional and is relatively easily reflected or blocked by any type of barrier. The wavelength of a 16-kHz tone, for example, is about $\frac{3}{4}$ inch, so a barrier of 1 to 2 inches higher than the source is generally sufficient to reflect noise of approximately the same frequency away from a nearby worker.
- High frequency audible noise is also easily absorbed by any of the so-called acoustical materials (e.g., glass fiber or foam).

Administrative Controls

When engineering controls are not reasonably achievable or are not sufficiently effective in controlling the noise exposure, the IH group may recommend administrative controls in the form of restricted time- access to high noise areas or rotation of employees during the workshift to achieve compliance with employee exposure standards. The use of administrative controls will be at discretion of the IH group if conditions of exposure are deemed to be acceptable and if provisions are demonstrated for enforcement of the control procedures by line management.

The only official copy is on-line at the SHSD IH Group website.
Before using a printed copy, verify that it is current by checking the document issue date on the website.

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- Administrative practices may require shift rotation or exposure limitation.

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Personal Protective Equipment

When Engineering and Administrative Controls have failed to achieve desired noise reduction, the IH group will assist in specifying and training in the use of personal hearing protective devices, including ear plugs and ear muffs. Selection of the devices should be made based on the level of attenuation needed, conditions under which the device will be used, characteristics of the user of the device, applicable statutes, and information from ANSI, ASA, NIOSH, ACGIH, other publications and vendor literature. Attenuation shall be based on IH96150 Attachment 8.2.

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Attachment 8.2

Guidance on Estimating the Adequacy of Hearing Protector Attenuation

Noise Reduction Ratings (NRR) were developed by the Environmental Protection Agency (EPA) and must be shown on the hearing protector package. OSHA 29CFR1910.95 *Appendix B* describes methods of using the NRR to determine whether a particular hearing protector provides adequate protection and have been adopted by the BNL NHC Administrator. However, the OSHA Technical Manual recommends *Field Attenuation of Hearing Protection* to estimate the attenuation afforded to a noise-exposed employee in an actual work environment. This is because the field use of ear protectors does not afford the same degree of protection achieved in the laboratory using well-trained subjects under ideal test conditions. To adjust for workplace conditions, applying a safety factor of 50% is recommended by OSHA and adopted by the BNL SHSD Industrial Hygiene Group as their policy hearing protection recommendations.

Selection of method depends upon the noise measuring instrument. Use the following methods, or a more protective method, to determine the adequacy of hearing protectors. When using the NRR to assess hearing protector adequacy, adjust the NRR by the following:

Weighting	OSHA Attenuation Methodology
A	Dosimeter taking A-weighted measurements: (A) Convert the A-weighted dose to TWA. (B) Subtract 7 dB from the NRR. (C) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector. (D) To adjust for workplace conditions, apply a safety factor of 50% (i.e. divide by 2).
A	Sound level meter set to the A-weighting network for area monitoring : (A) Subtract 7 dB from the NRR for the area or the employee's A-weighted TWA. (B) Subtract the remainder from the A-weighted sound level for the area or from the A-weighted TWA. (C) To adjust for workplace conditions, apply a safety factor of 50% (i.e. divide by 2).
C	Dosimeter capable of C-weighted measurements: (A) Obtain the employee's C-weighted dose for the entire workshift, and convert to TWA. (B) Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector. (C) To adjust for workplace conditions, apply a safety factor of 50% (i.e. divide by 2).

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C	<p><u>Sound level meter</u> set on the C-weighting network for <u>area monitoring</u>:</p> <p>(A) Obtain a representative sample of the C-weighted sound levels in the employee's environment.</p> <p>(B) Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.</p> <p>(C) To adjust for workplace conditions, apply a safety factor of 50% (i.e. divide by 2).</p>
<p>Combining Ear Muff and Ear Plugs:</p> <p>C. <u>A weighting</u>: Determine the laboratory-based noise attenuation (NRR) for the higher rated hearing protector, subtract 7dB, and apply a safety factor of 50%. Then add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.</p> <p>D. <u>C weighting</u>: Determine the laboratory-based noise attenuation (NRR) for the higher rated hearing protector apply a safety factor of 50%. Then add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.</p>	

The following example shows how the safety factor is used:

TWA₈ = 100 dBA
Muff NRR = 19 dB

Laboratory Rated Attenuation is: (19-7) = 12 dB
Approximate Field Attenuation is: (19-7) × 50% = 6 dB

100 dBA TWA₈ - 12 dB = 88 dBA
100 dBA TWA₈ - 6 dB = 94 dBA

Conclusion:

The protected TWA using the safety factor is 94 dBA. Feasible engineering controls must be implemented. (The OSHA HCA does not require applying a 50% correction factor, so for regulatory compliance, the protected TWA is 88 dBA. Therefore, hearing protection with greater attenuation is not required by the OSHA standard. If an employee exhibits an STS, better hearing protection may be required.)